

Reg. No .....

Name .....

18P429

**M Sc DEGREE END SEMESTER EXAMINATION - MARCH 2018****SEMESTER 4 : PHYSICS****COURSE : 16P4PHYT15EL ; OPTOELECTRONICS***(For Regular - 2016 admission)*

Time : Three Hours

Max. Marks: 75

**Section A****Answer all questions (1 marks each)**

1. In degenerate  $n^+$  semiconductors  
(A) The Fermi level is within the conduction band (B) The Fermi level is within the valence band (C) Middle of the band gap (D) Near the conduction band edge.
2. Among the dispersion which has higher magnitude in a silica fiber  
(A) Multimode dispersion (B) Material dispersion (C) Waveguide dispersion (D) Refractive index profile dispersion
3. In passive mode locking  
(A) External power is required (B) No External power is required (C) Need passive circuit elements (D) Need Active circuit elements
4. In phototransistor, the photocurrent flowing in the external circuit is  
(A)  $I_{PH} \approx \beta I_{PHO}$  (B)  $I_{PH} \geq \beta I_{PHO}$  (C)  $I_{PH} \approx \beta I_{PH}$  (D)  $I_{PH} \leq \beta I_{PHO}$
5. Self-focusing Phenomenon is a  
(A) Linear process (B) Second harmonic generation (C) Third Harmonic generation (D) Fourth harmonic generation

**(1 x 5 = 5)****Section B****Answer any 7 (2 marks each)**

6. Write short note on selection criterion for LED material.
7. Explain the quantum mechanical explanation for the E – K diagram.
8. What is an Evanescent wave?
9. Explain briefly the working of a hetrojunction laser.
10. Give the difference between active and passive mode locking.
11. Explain the principle of quantum well laser
12. Explain the working of a phototransistor.
13. Why photodiode is operated in the reverse bias condition.
14. Explain the term phase matching in nonlinear optics.
15. Write a short note on two photon absorption.

**(2 x 7 = 14)****Section C****Answer any 4 (5 marks each)**

17. What is meant by Q- switching? How is it achieved using electro-optic method?
18. Explain the working of a heterojunction GaAs laser. What are the added advantages of a double heterojunction lasers.
19. With the help of a schematic diagram explain the working of a PIN Photodiode.
20. Describe the working of an avalanche photodiode. How it is superior to an ordinary PD.
21. Explain with theory the phenomenon of self-focusing.

**(5 x 4 = 20)**

#### **Section D**

#### **Answer any 3 (12 marks each)**

22. Explain Power and efficiency of LED and show how the efficiency can be made maximum.
23. Explain the different types of modal and wave guide dispersions in the planar wave guide.
24. Discuss high power laser pulses through Q- switching. Explain active and passive Q – switching.
25. Write notes on heterostructure laser diode and Optical laser amplifier.
26. Explain detection process in the p-n photodiode. Compare this with the PIN photodiode.
27. Explain with theory the non – linear phenomenon of second harmonic generation and obtain the expression for efficiency.

**(12 x 3 = 36)**